The leader in acoustics and vibration…

INVESTIGATIVE SCIENCE AND ENGINEERING, INC.
Scientific, Environmental, and Forensic Consultants

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January 11, 2006 (Revised)

Mr. Earle Crummy
2003 Via Del Torrie
Alpine, CA 91901

RE: ACOUSTICAL SITE ASSESSMENT
BRAYTON WAY TPM 20918; ER 05-14-006 – SAN DIEGO, CA
ISE REPORT #05-069

Dear Mr. Crummy:

At your request, Investigative Science and Engineering (ISE) have performed an acoustical site assessment of the proposed TPM 20918 residential development located in San Diego, California. The results of the survey, as well as predicted future noise levels at the project site, are presented in this letter report.

INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The project site consists of approximately two acres located east of Brayton Way having a physical address of 1461 Brayton Way in an unincorporated area of El Cajon within the County of San Diego. I-8 provides regional access to the project area (refer to Figure 1). An aerial photograph of the project area and surrounding community is shown below in Figure 2 on Page 3 of this report.

The proposed project is currently zoned RR2 (Rural Residential) and does not propose any land use changes. The proposed development area currently resides as mostly disturbed land with a northwesterly sloped topography from approximately 550 feet above mean sea level (MSL) at the southeastern corner to approximately 570 feet MSL at the western boundary.

Project Description

The development plan calls for the subdivision of the two acres into three parcels. The existing residential domain proposes no new structural modifications and would occupy .92 gross acres (Parcel 1). The two remainder parcels (Parcel 2 and -3) will divide the remainder open space into approximate .5-acre parcels. Parcel 2 and -3 will have a small amount of grading which is expected to be a balanced cut/fill operation. A site development plan can be seen in Figure 3 on Page 4.

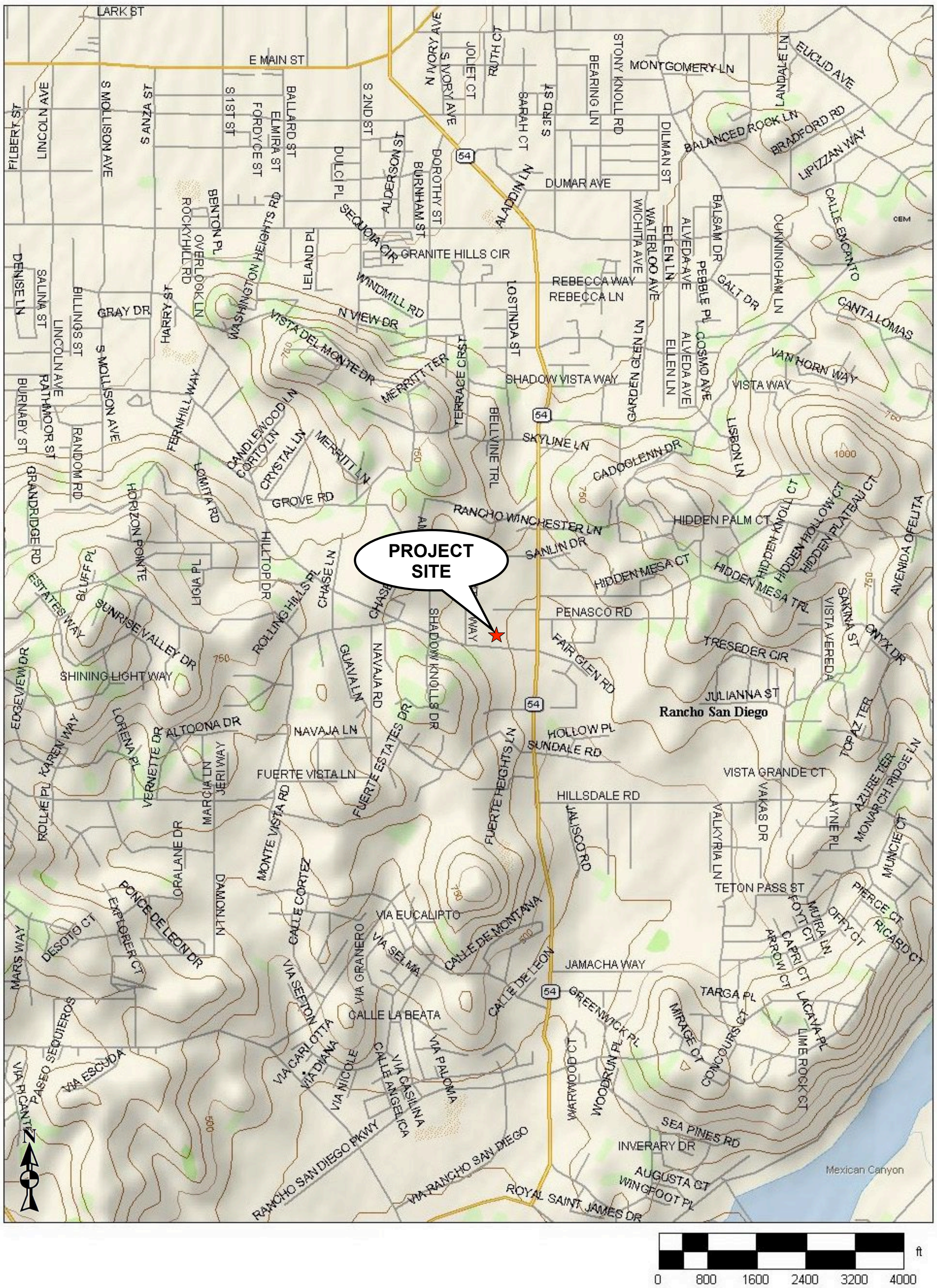

FIGURE 1: Project Vicinity Map – TPM 20918 (ISE 7/05)

FIGURE 2: Project Site Aerial Photograph (© CNES 7/05)

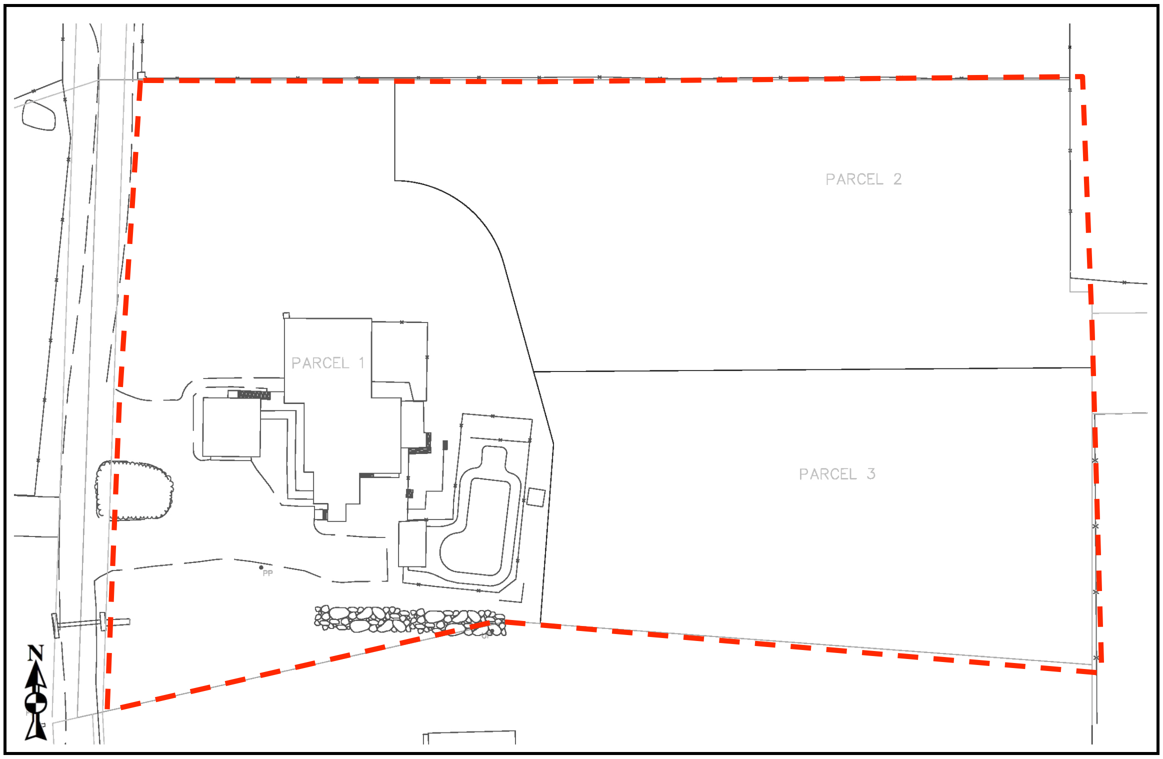

FIGURE 3: Proposed Site Plan (Snipes-Dye Associates 2005)

Acoustical Definitions

Sound waves are linear mechanical waves. They can be propagated in solids, liquids, and gases. The material transmitting such a wave oscillates in the direction of propagation of the wave itself. Sound waves originate from some sort of vibrating surface. Whether this surface is the vibrating string of a violin or a person's vocal cords, a vibrating column of air from an organ or clarinet, or a vibrating panel from a loudspeaker, drum, or aircraft, the sound waves generated are all similar. All of these vibrating elements alternately compress the surrounding air during forward motion and expand it on the backward movement.

There is a large range of frequencies within which linear waves can be generated, sound waves being confined to the frequency range that can stimulate the auditory organs to the sensation of hearing. For humans this range is from about 20 Hertz (Hz or cycles per second) to about 20,000 Hz. The air transmits these frequency disturbances outward from the source of the wave. Sound waves, if unimpeded, will spread out in all directions from a source. Upon entering the auditory organs, these waves produce the sensation of sound. Waveforms that are approximately periodic or consist of a small number of periodic components can give rise to a pleasant sensation (assuming the intensity is not too high), for example, as in a musical composition. Noise, on the other hand, can be represented as a superposition of periodic waves with a large number of components.

Noise is generally defined as unwanted or annoying sound that is typically associated with human activity and which interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day, and the sensitivity of the individual hearing the sound.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric levels. The loudest sounds that the human ear can hear comfortably are approximately one trillion (or $1x10^{12}$) times the acoustic energy that the ear can barely detect. Because of this vast range, any attempt to represent the acoustic intensity of a particular sound on a linear scale becomes unwieldy. As a result, a logarithmic ratio originally conceived for radio work known as the decibel (dB) is commonly employed.

A sound level of zero “0” dB is scaled such that it is defined as the threshold of human hearing and would be barely audible to a human of normal hearing under extremely quiet listening conditions. Such conditions can only be generated in anechoic or “dead rooms”. Typically, the quietest environmental conditions (extreme rural areas with extensive shielding) yield sound levels of approximately 20 dB. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB roughly correspond to the threshold of pain and would be associated with sources such as jet engine noise or pneumatic equipment.

The minimum change in sound level that the human ear can detect is approximately 3 dB. A change in sound level of 10 dB is usually perceived by the average person as a doubling (or halving) of the sounds loudness. A change in sound level of 10 dB actually represents an approximate 90 percent change in the sound intensity, but only about a 50 percent change in the perceived loudness. This is due to the nonlinear response of the human ear to sound.

As mentioned above, most of the sounds we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate the sound we hear. The method commonly used to quantify environmental sounds consists of determining all of the frequencies of a sound according to a weighting system that reflects the nonlinear response characteristics of the human ear. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (or dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of sounds from distant sources that create a relatively steady background noise in which no particular source is identifiable. For this type of noise, a single descriptor called the Leq (or equivalent sound level) is used. Leq is the energy-mean A-weighted sound level during a measured time interval. It is the 'equivalent' constant sound level that would have to be produced by a given source to equal the average of the fluctuating level measured. For most acoustical studies, the study interval is generally taken as one-hour and is abbreviated *Leq-h*; however, other time intervals are utilized depending on the jurisdictional preference.

To describe the time-varying character of environmental noise, the statistical noise descriptors L10, L50, and L90 are commonly used. They are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of a stated time. Sound levels associated with the L10 typically describe transient or short-term events, while levels associated with the L90 describe the steady state (or most prevalent) noise conditions. In addition, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum and minimum measured sound level (Lmax and Lmin) indicators. The Lmin value obtained for a particular monitoring location is often called the *acoustic floor* for that location.

Another sound measure employed by the State of California and the County of San Diego is known as the Community Noise Equivalence Level (CNEL) is defined as the "A" weighted average sound level for a 24-hour day. It is calculated by adding a 5-decibel penalty to sound levels in the evening (7:00 p.m. to 10:00 p.m.), and a 10-decibel penalty to sound levels in the night (10:00 p.m. to 7:00 a.m.) to compensate for the increased sensitivity to noise during the quieter evening and nighttime hours.

APPLICABLE SIGNIFICANCE CRITERIA

County of San Diego Noise Regulations

Transportation noise levels in the County of San Diego are governed under the Noise Element of the County's General Plan. The relevant sections of the Noise Element are cited below. Exterior noise standards are typically applied to areas within a proposed development that would be classified as "usable exterior space", such as rear and some side yards.

1. Whenever possible, development in San Diego County should be planned and constructed so that noise sensitive areas are not subject to noise levels in excess if 55 dBA CNEL.
2. Whenever it appears that new development will result in any (existing or future) noise sensitive areas being subjected to noise levels in excess of 60 dBA CNEL or greater, an acoustical study should be required.

3. If the acoustical study shows that noise levels at any noise sensitive areas will exceed 60 dBA CNEL, the development should not be approved unless the following findings are made:
   a) Modifications to the development have been or will be made which reduce the exterior noise level below 60 dBA CNEL; or,
   b) If, with the current noise abatement technology, it is infeasible to reduce the exterior CNEL to 60 dBA, then modifications to the development will be made which reduce interior noise below a CNEL equal to 45 dBA. Particular attention shall be given to noise sensitive interior spaces such as bedrooms; and,
   c) If finding 'b' above is made, a further finding will be made that there are specifically identified overriding social or economic considerations which warrant approval of the development without modifications as described in 'a' above.
4) If the acoustical study shows that the noise levels at any noise sensitive areas will exceed 75 dBA CNEL; the development should not be approved.
5) Interior noise levels should not exceed 45 dBA CNEL within any habitable living space of any residential unit.

Additionally, if the acoustical study shows that off-site noise levels at any noise sensitive receptor will increase by 3 dBA or more, due the proposed project; the development should look for a feasible mitigation plan.

State of California CCR Title 24

The California Code of Regulations (CCR), Title 24, Noise Insulation Standards, states that multi-family dwellings, hotels, and motels located where the CNEL exceeds 60 dBA, must obtain an acoustical analysis showing that the proposed design will limit interior noise to less than 45 dBA CNEL. Interior noise standards are typically applied to sensitive areas within the structure where low noise levels are desirable (such as living rooms, dining rooms, bedrooms, and dens or studies).

Worst-case noise levels, either existing or future, must be used for this determination. Future noise levels must be predicted at least ten years from the time of building permit application. The County of San Diego has adopted the CCR Title 24 standards, although for the purposes of environmental analysis, utilizes the interior threshold (above) from the Noise Element of the General Plan. Thus, for the purposes of analysis, the applicable exterior noise design threshold is 60 dBA CNEL. The applicable interior noise standard is 45 dBA CNEL.

ANALYSIS METHODOLOGY

Site Monitoring Procedure

One Quest Model 2900 ANSI Type 2 integrating sound level meter was used as the data collection device. The meter location (denoted as ML 1) was mounted to a tripod approximately five feet above the ground and was placed within the project boundaries. The meter was placed at the worst-case noise exposure location within project site. This was done in order to capture the existing noise levels within the proposed project site during normal afternoon traffic flow conditions. The monitoring location is shown graphically in Figure 4 below.

The measurements were performed on May 26, 2005 starting at approximately 4:00 p.m. All equipment was calibrated before testing at ISE's acoustics and vibration laboratory to verify conformance with ANSI S1-4 1983 Type 2 and IEC 651 Type 2 standards

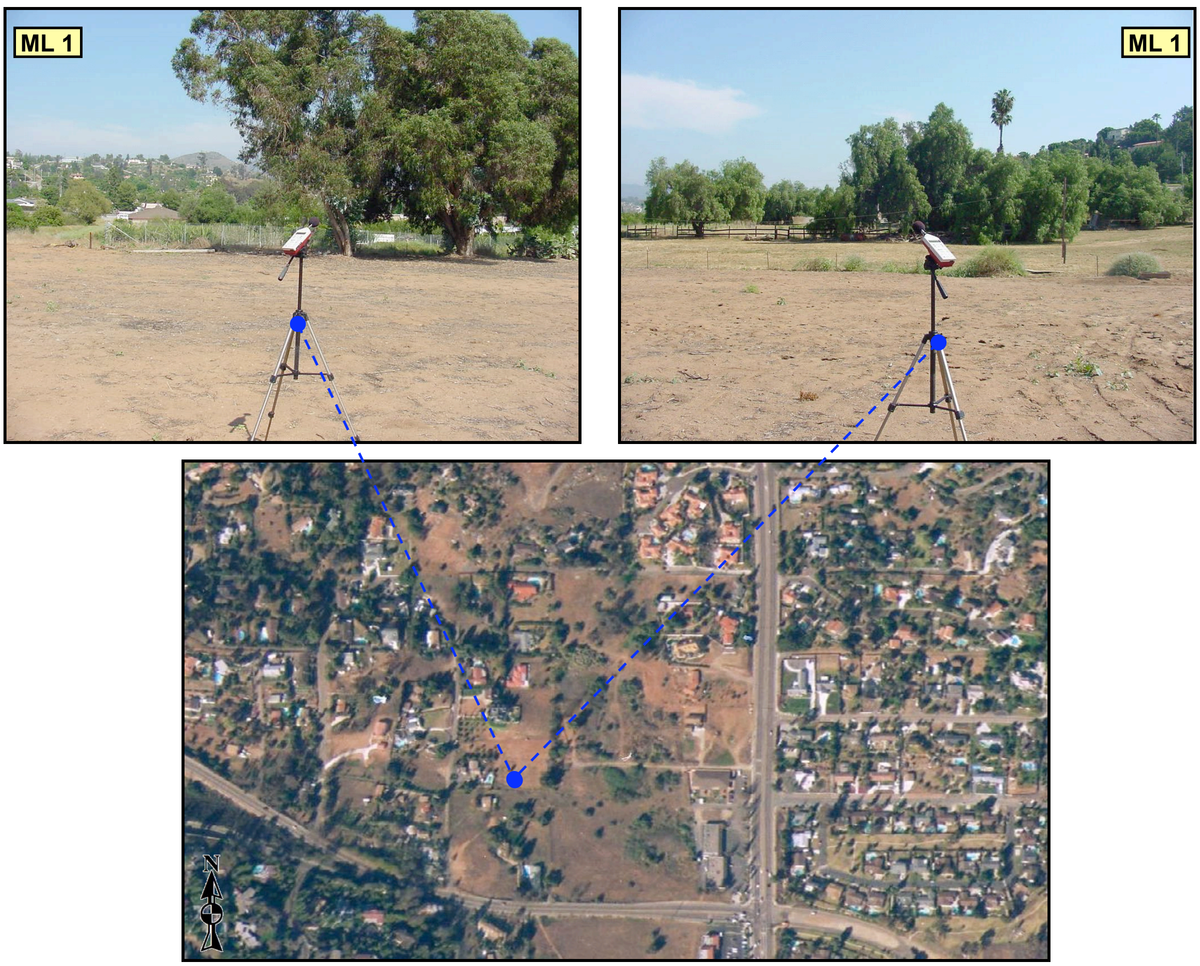

FIGURE 4: Ambient Noise Monitoring Locations (ISE 5/05)

Traffic Noise Impact Assessment Approach

The Caltrans Sound 32 Traffic Noise Prediction Model with California (CALVENO) noise emission factors (*based on FHWA RD-77-108 and FHWA/CA/TL-87/03 standards*) were used to calculate future onsite vehicular traffic noise levels. The Sound 32 model was calibrated in accordance with Appendix E of the FHWA Highway Traffic Noise Prediction Manual (Report RD-77-108) for a normalized Level of Service of 'C'. This is also in accordance with Caltrans Technical Noise Supplement (TeNS) sections N-5440 & N-5460 published October 1998. Model input included:

- A digitized representation of all major roadways (i.e., Chase Ave. and State Highway 54 also know as Jamacha Road)
- Future Average Daily Trips (ADTs) for nearby major roadways (*Source: County of San Diego, 7/05*)
- 90/6/4 (automobiles/medium/heavy vehicles) traffic mix
- Receptor elevations
- Topography as identified in the project site plans (*Source: Snipes-Dye Associates, 2005*)

Receptor elevations were considered five feet above the appropriate floor (pad) elevation and were taken near the center of each proposed lot. The model assumed a "hard" site sound propagation rule (i.e., a 4.5-dBA loss per doubling of distance from roadway to receiver) because the project site is over 600 feet to the nearest roadway and obstructed by buildings and shrubs. Second floor receptor areas were modeled at 15 feet above the respective pad elevation. The receptor locations can be seen in Figure 5 on the following page.

FINDINGS / RECOMMENDATIONS

Testing conditions during the monitoring period were mostly sunny with an average barometric pressure reading of 29.97 in-Hg, an average southwesterly wind speed of 7 to 8 miles per hour (MPH), and an approximate mean temperature of 78 degrees Fahrenheit. The results of the sound level monitoring are shown below in Table 1 below. The values for the equivalent sound level (Leq), the maximum and minimum measured sound levels (Lmax and Lmin), and the statistical indicators L10, L50, and L90, are given for each monitoring location.

Noise levels on site were found to be consistent with the observed community setting and topography. The value for the equivalent sound level (Leq-h) within the project site was found to be approximately 48 dBA. Background noise levels (i.e., L90 levels) were found to be slightly lower than the energy equivalent counterpart (e.g., Leq-h) indicating the high frequency of traffic noise along Chase Ave. and Jamacha Road. The acoustic floor for the site, as indicated by the Lmin metric, was found to be approximately 40 dBA.

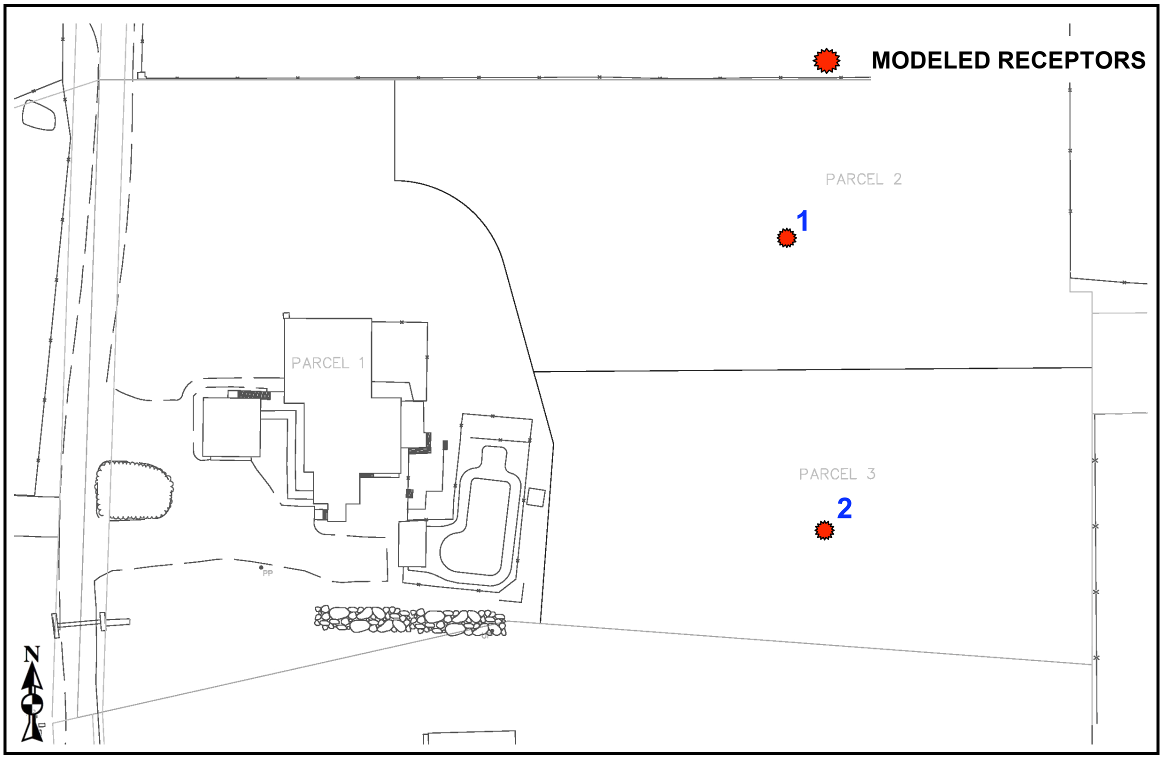

FIGURE 5: Modeled Receptor Locations (ISE 7/05)

TABLE 1: Measured Ambient Sound Levels – TPM 20918 Site Development

		1-Hour Noise Level Descriptors in dBA					
Site	**Start Time**	**Leq**	**Lmax**	**Lmin**	**L10**	**L50**	**L90**
ML 1	4:00 p.m.	48.2	59	39.9	50.2	47.4	44.1

Monitoring Locations:

- ML 1: Center portion of the project site - GPS N32° 46.240 x W116° 55.850. Meter located approximately 200 feet from roadway edge.

Measurements performed by ISE on May 26, 2005. Estimated Position Error (EPE) = 22 feet.

Future Traffic Noise Impacts

The primary source of future noise near the project site would be from traffic along the various adjacent servicing roadways. Table 2 below references peak hour traffic volumes from Chase Ave. and Jamacha Road (*Source: SANDAG 2030 Series 10 Traffic Forecast 1/06).*

TABLE 2: Future Traffic Predictions – TPM 20918 Residential Development

Roadway Segment	Peak Hour Traffic Volume (Vehicles)	Projected Traffic Speed (MPH)
Chase Ave. (West)	1,800	50
Chase Ave. (East)	1,000	50
Jamacha Rd. (North of Maryann Way)	2,400	50
Jamacha Rd. (South of Maryann Way)	3,100	50

Source: Future Peak Hour Traffic Volumes – SANDAG 2030 Series 10, 1/06.

Peak hour traffic values are calculated for a 90/6/4 (automobiles/medium/heavy vehicles) percent mix in accordance with City and Caltrans traffic forecasting practices and the observed traffic distribution for a major road. Model output consisted of peak hour energy-mean A-weighted sound levels (or Leq-h) for each receptor examined. For peak hour traffic percentages between approximately 8 and 12 percent, the energy-mean A-weighted sound level is equivalent to the Community Noise Equivalent Level (CNEL). Outside this range, a maximum variance of up to two dBA occurs between Leq-h and CNEL

The results of the acoustical modeling are shown below in Table 3 for a selected lot sampling within the proposed development. The acoustical model results are provided as an attachment to this report. As can be seen, no acoustical impacts are anticipated. No mitigation is required. Figure 6 below shows the predicted 57 dBA CNEL noise contours.

TABLE 3: Acoustical Modeling Results – TM 20918 Residential Development

Receptor #	Ground Level	Second Level
1	56.4	56.5
2	57.2	57.3

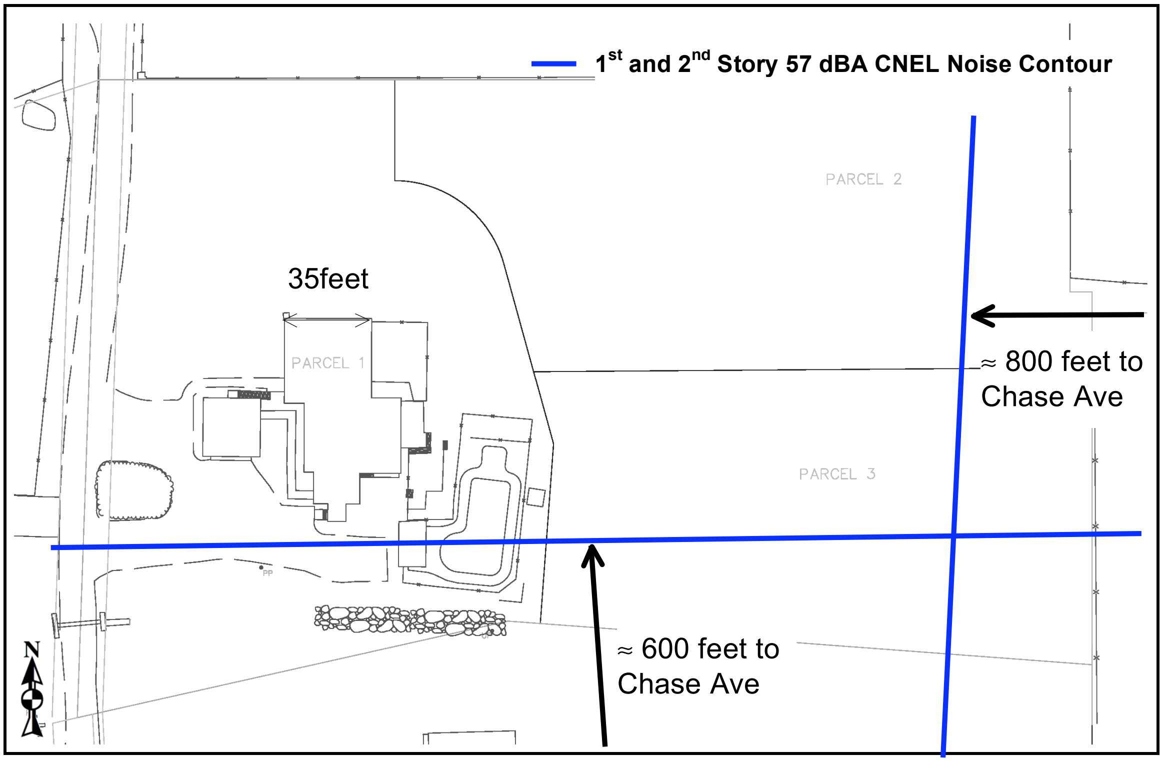

FIGURE 6: Approximate 57 dBA CNEL Noise Contours (ISE 7/05)

Should you have any questions regarding the above conclusions, please do not hesitate to contact me at (858) 451-3505.

Sincerely,

Rick Tavares

Rick Tavares, Ph.D.
Project Principal
Investigative Science and Engineering, Inc.

Cc: Ryan Taylor, ISE

Attachments: Sound32 Model Input/Output Decks

S32 INPUT DECK – GROUND FLOOR

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CRUMMY GROUND FLOOR
T-NORTH JAMACHA, 1
 2160 , 50 , 144 , 50 , 96 , 50
T-SOUTH JAMACHA, 2
 2790 , 50 , 186 , 50 , 124 , 50
T-WEST CHASE, 3
 1620 , 50 , 108 , 50 , 72 , 50
T-WEST CHASE, 4
 1620 , 50 , 108 , 50 , 72 , 50
T-EAST CHASE, 5
 900 , 50 , 60 , 50 , 40 , 50
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C,C
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SOUND32 - RELEASE 07/30/91

TITLE: CRUMMY GROUND FLOOR

BARRIER DATA
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3	-	0.*							B1 P3	76.5	MASONRY
4	-	0.*							B1 P4	100.7	MASONRY
5	-	0.*							B1 P5	141.1	MASONRY
6	-	0.*							B1 P6	94.1	MASONRY
7	-	0.*							B1 P7	85.1	MASONRY
8	-	0.*							B1 P8	82.2	MASONRY
9	-	0.*							B1 P9	82.4	MASONRY
10	-	0.*							B2 P1	88.7	MASONRY
11	-	0.*							B2 P2	82.2	MASONRY

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13     -   0.*                                B2 P4       78.4  MASONRY
14     -   0.*                                B2 P5       84.0  MASONRY
15     -   0.*                                B2 P6       83.7  MASONRY
16     -   0.*                                B2 P7       74.6  MASONRY
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18     -   0.*                                B2 P9      301.3  MASONRY

19     -   0.*                                B3 P1       59.5  MASONRY
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21     -   0.*                                B3 P3      308.5  MASONRY

22     -   0.*                                B4 P1       54.4  MASONRY
23     -   0.*                                B4 P2       44.0  MASONRY
24     -   0.*                                B4 P3       36.2  MASONRY
25     -   0.*                                B4 P4       79.2  MASONRY

26     -   0.*                                B5 P1       90.4  MASONRY
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28     -   0.*                                B5 P3       54.4  MASONRY

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30     -   0.*                                B6 P2       84.4  MASONRY
31     -   0.*                                B6 P3       86.2  MASONRY

32     -   0.*                                B7 P1       75.2  MASONRY
33     -   0.*                                B7 P2      112.9  MASONRY
34     -   0.*                                B7 P3      112.6  MASONRY
35     -   0.*                                B7 P4       72.1  MASONRY
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       0    1    2    3    4    5    6    7
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REC	REC ID	DNL	PEOPLE	LEQ(CAL)
1	P2	65.	10.	56.4
2	P3	65.	10.	57.2

S32 INPUT DECK – UPPER FLOOR

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CRUMMY SECOND FLOOR
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 2160 , 50 , 144 , 50 , 96 , 50
T-SOUTH JAMACHA, 2
 2790 , 50 , 186 , 50 , 124 , 50
T-WEST CHASE, 3
 1620 , 50 , 108 , 50 , 72 , 50
T-WEST CHASE, 4
 1620 , 50 , 108 , 50 , 72 , 50
T-EAST CHASE, 5
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SOUND32 - RELEASE 07/30/91

TITLE: CRUMMY SECOND FLOOR

BARRIER DATA
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BAR ELE	0	1	2	3	4	5	6	7	BAR ID	LENGTH	TYPE
1	-	0.*							B1 P1	994.7	MASONRY
2	-	0.*							B1 P2	415.2	MASONRY
3	-	0.*							B1 P3	76.5	MASONRY
4	-	0.*							B1 P4	100.7	MASONRY
5	-	0.*							B1 P5	141.1	MASONRY
6	-	0.*							B1 P6	94.1	MASONRY
7	-	0.*							B1 P7	85.1	MASONRY
8	-	0.*							B1 P8	82.2	MASONRY
9	-	0.*							B1 P9	82.4	MASONRY
10	-	0.*							B2 P1	88.7	MASONRY
11	-	0.*							B2 P2	82.2	MASONRY

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12     -   0.*                                            B2 P3       89.2  MASONRY
13     -   0.*                                            B2 P4       78.4  MASONRY
14     -   0.*                                            B2 P5       84.0  MASONRY
15     -   0.*                                            B2 P6       83.7  MASONRY
16     -   0.*                                            B2 P7       74.6  MASONRY
17     -   0.*                                            B2 P8       23.9  MASONRY
18     -   0.*                                            B2 P9      301.3  MASONRY

19     -   0.*                                            B3 P1       59.5  MASONRY
20     -   0.*                                            B3 P2      199.5  MASONRY
21     -   0.*                                            B3 P3      308.5  MASONRY

22     -   0.*                                            B4 P1       54.4  MASONRY
23     -   0.*                                            B4 P2       44.0  MASONRY
24     -   0.*                                            B4 P3       36.2  MASONRY
25     -   0.*                                            B4 P4       79.2  MASONRY

26     -   0.*                                            B5 P1       90.4  MASONRY
27     -   0.*                                            B5 P2       56.9  MASONRY
28     -   0.*                                            B5 P3       54.4  MASONRY

29     -   0.*                                            B6 P1       81.3  MASONRY
30     -   0.*                                            B6 P2       84.4  MASONRY
31     -   0.*                                            B6 P3       86.2  MASONRY

32     -   0.*                                            B7 P1       75.2  MASONRY
33     -   0.*                                            B7 P2      112.9  MASONRY
34     -   0.*                                            B7 P3      112.6  MASONRY
35     -   0.*                                            B7 P4       72.1  MASONRY
------------------------------------------------------------------------------
       0    1    2    3    4    5    6    7

REC REC ID    DNL  PEOPLE   LEQ(CAL)
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 1  P2        65.     10.   56.5
 2  P3        65.     10.   57.3
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